

# “Health in your Homes.”

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## A LECTURE,

Delivered to the Members and Friends of  
St. George's Young Men's Society,  
Barnsley, Feb. 24th, 1885,

BY

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## “HEALTH IN YOUR HOMES.”

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When I had the honour to address this Society last year, on the subject of “Personal Health,” a wish was expressed at the close of the lecture that I should give you another one on a kindred subject. I need not say that I felt honoured by the proposal, and, having willingly acceded to it, I am here to-night to carry out your request and my promise. “Difficulties are opportunities” is a late addition to the aphorisms of our language, and since your president has vouchsafed me the present opportunity, I have felt with increasing, and well nigh overwhelming, force, that the converse is true—that opportunities are also difficulties. My first difficulty was a choice of a subject, one that might interest you, and from which you might glean some useful knowledge; and then passed through my mind the story we all know of the resentful lion who had often been painted by the man, and who longed, in his turn, for the time to come when the man should be painted by the lion. The present age is one of inquiry; we are all taking less on trust—we wish to know the reason why everything is done. All knowledge is making great strides. No knowledge has made greater strides than the science of sanitation: it is full of interest. I therefore felt that I could not do better than take another branch of our subject of last year; and so the title of my address to you to-night shall be, “Health in your homes.” By the word homes, we will not necessarily confine ourselves to the bare structure of the house in which man lives, but to the use to which he puts it, and to its relation to health and disease in his association with his family. If we look back upon the history of past times, we cannot fail to be impressed with the fact that, with a comparative disregard for those conditions which we now believe to be essential to health, England was able to produce a race of strong, hardy men, who did great deeds, overcame great obstructions, and whose span of life was considerable. With this

fact before us, may we not ask, "Why shall we consider how and in what way shall we live?" Is there any real reason for the growth of a demand which is becoming more and more pressing that the every day conditions of life shall be regulated by considerations for health? In the time to which I refer, there were many who lived to grow up, and carry out the duties of life; but for the many who lived, how many died? Nothing is more depressing than a study of the rate at which people died a few centuries ago. Hecker tells us, in his "Epidemic of the Middle Ages," how hundreds of thousands were smitten with disease. In the year 1343 the Plague alone carried off half the population of England, and that the "ravages were fiercest in the greater towns, where filthy, undrained streets, afforded a constant haunt for leprosy and fever." In 1665, in six months, one hundred thousand died of the Plague in London. The plan adopted by the Government for trying to keep it in check was by closing up the people in their houses, with a guard to prevent their exit, while a red cross was marked on each door, with the words, "Lord have mercy upon us." Small pox, typhus, and scarlet fever, have been equally fatal. In Russia, during the eighteenth century, two millions were killed by small-pox. To show how common was the disease at one time, the family of our William III., his wife, father, mother, uncle, and two cousins died of it, and the king himself was attacked by it. For every two persons killed in England by the Plague, three had died of small-pox. Happily, now, it has been controlled by vaccination. As to the mortality of scarlet fever, in the year 1883 1,989 persons died in London alone from it; while in the ten years from 1861 to 1870, it caused the death of 34,000 people. Murphy tells us that it is probable that the death rate in the seventeenth century amounted to fifty annually for every thousand of population; and other evidence tends to show that, during that century, the number of deaths exceeded the number of births. Our forefathers, therefore, did not escape from terrible visitations of disease, but suffered to a degree to which there is no parallel in our time. I would not have you suppose, that sanitary science is something new—it is as old as literature. If you refer to the Book of Leviticus, you will find how full and minute are the references to the laws and regulations for the preservation of health. Pagau Rome was superior to Pontifical in the observance

of sanitary laws. The disposal of animal refuse seems to have engaged in the century before Christ a large amount of civic care. Excavations recently in progress on the margins of the Viminal and Esquiline Hills have brought to light inscriptions bearing upon the sanitary regulations of that period, one of them referring to the guardianship of the limits imposed on an extensive manure field in the Campus Viaminalis. The inscription concludes with the sanitary admonition translated, "Remove ordure to a great distance, as you would avoid evil consequences." Coming down to the dark ages, monkish legends tell us how St. Ambrose smelt a shocking smell in his monastery, and, do what he would, the worthy friar could not cure it. At last, in a dream, he learned that it was a persecution of the Evil One, and, thus informed, he rose, and, with bell, book, and candle, solemnly exorcised the nuisance, and it fled (so complete was the miracle) out of the door, in a solid bodily form, with a tail some seven cubits in length! Another legend to the same effect runs thus:—"That David, the blessed champion of Wales, perceiving that, by enchantment, powerful odours of evil sort were likely to prevail against him, took certain herbs, of dittany a little, and of rosemary some, also a handful of bergamot, and, having incanted therewithal, he bade the fiend avaunt, and it avaunted." Nor in this connection should it be forgotten how painfully Christian suffered in the valley of humiliation by reason of the evil emanations with which the powers of darkness assailed him, and how he eventually triumphed. And "Wonder not at that," as Don Quixote said, "for your devils are a knowing sort of people, and many carry perfumes about them, though they have no scent in themselves, being spirits; or, if any odour proceed from them, it cannot be of a pleasing, but must be of an abominable nature, because they carry their purgatory wherever they go." Epidemics were in past days attributed to the Divine anger, the influence of the dog star, to earthquakes, eclipses, and the Aurora Borealis. Lord Bacon referred to the sweating sickness as having been produced by a malaria in the air, gathered by a predisposition of the seasons. In the case of many of the epidemics, the people got the idea that their wells had been poisoned by the Jews, whereas they were poisoned by the sewage, which was drained into them. Panics arose, and in one of these, at Mayence, 12,000 Jews were killed. The wells were thought to be poisoned in Paris, in 1832, during the cholera. The same kind of panic

took place the other day at Naples, when the priests and the doctors were pursued in the streets. The true cause of epidemics has been found to be the presence in the body of minute organisms, which float in the air, are present in water, in heaps of refuse, and, indeed, in everything exposed to the atmosphere. The organisms which produce scarlet fever, small pox, &c., caused these individual ailments only, just as wheat, when sown, produced wheat in return. These epidemics are not peculiar to men. Vegetables, insects, and cattle also suffer from them; and books have even been written, recently, on the diseases of wine and beer. Henry Fitz Alwyne, first Lord Mayor of London, in his Assize of Buildings, issued in the reign of Stephen, had regard, it is true, rather to the prevention of fire than the prevention of disease, but the regulations which he made concerning "necessary chambers," prove that he knew the importance of dealing with, at any rate, this point, while the subsequent efforts made during the reign of Elizabeth, to prevent over-crowding, and to ensure each new-built house with four acres of land, show us how, 300 years ago, it was thoroughly understood—the necessity of a certain amount of air-space for each person. It is self-evident, that the passing of such laws was ineffectual to prevent the high mortality which prevailed. This was due to their non-observance. The laws themselves were far a-head of the people; and it is probable that they were totally disregarded, or only enforced in times of great emergency. During the last thirty years much has been done in sanitary legislation; wider streets have been made, good drainage and pure water have been secured, cellar dwellings have much diminished in our towns, and yet, after all this, what is the out-come of it? And I ask myself the question, Has it reduced the rate of mortality? I answer, "Yes," but, speaking generally, the result has not been so marked, or decisive, as sanitarians could have wished, and therefore, when amelioration is not followed by its fairly expected consequences, there must surely be causes somewhere to explain this anomaly. Thirty years' experience of what were practically novel laws for England and Englishmen, has demonstrated the fact that the public in the aggregate take but slight interest in the administration of the sanitary laws, an apathy in itself so remarkable as to call for inquiry and discussion. In the selection of local representatives, where the election is made by voting

papers delivered at the house of the voter, a very high percentage of such papers are never filled in at all, and a large quantity only partially so. In selection by polling, where some of the rough excitement of a Parliamentary contest is thrown into the election, a little interest, if not enthusiasm, is exhibited; but, curiously enough, not in the qualifications of the candidate to fill an office exclusively municipal and sanitary, but in the fact of his being attached to this or that section of politics. To such an extent has the mischievous practice grown, that in most towns the political party to which the selected and rejected candidates belong has become a regular item in the newspaper reports of municipal elections, and the letters C. or L. are bracketed after the names of the new Mayors as though they formed an essential part of the official title. Barnsley proves the only exception I know to this rule. Why this want of interest on the one part, and misdirected interest on the other is shown, it is difficult to understand, and admits of but one interpretation, viz., ignorance of its importance. I can only attribute that partial neutralization of the good effects of sanitary measures to the thoughtless action of the people themselves, in omitting daily to correspond with what the legislative and local authorities have done for their advantage; for it is clear, that whatever be the good you would render to individuals, or to the masses, it can only be made fully available by suitable co-operation on the part of those for whom it is intended. It is only as the people, as a whole, become educated to see the relation of certain physical conditions to their health, and learn to appreciate to its full extent the value of good health and long life, that they will insist upon every care being taken to preserve them. As yet, they do not fully believe that health is absolutely affected by such conditions as the ventilation and drainage of a dwelling-house; and we are often met by the argument, that what was good enough for our fathers ought to be good enough for us. The man, or woman who never leaves his or her own home, nevertheless lives in at least two houses—the one built, say, of bricks and mortar; the other of materials which are converted by physiological and chemical processes into the mortal body in which we have our being or life. Sanitary science requires that the first shall be built of good and proper materials, that there shall be no admixture of sea-sand in the mortar used; that the lime dan

sand shall be in proper proportion; that all wood used in the building shall be sound and well-seasoned; that its sanitation shall be rigorously attended to as regards ventilation, warming, cubic space, dryness, gas and water supply; that provision shall be made for the supply of fresh and pure air, and every means taken to prevent the entrance of sewer gas, and the speedy removal or destruction of all matters likely to cause a nuisance, or be injurious to health. So, also, sanitary science, or preventive medicine, requires that every precaution be taken that the materials out of which our other, or bodily, dwelling is constructed, be of the best and purest kind. The materials out of which this bodily dwelling is built are food and drink, and it is exactly as this food and drink are sound, pure, and wholesome, that the bodily dwelling is properly constructed, and fitted to discharge, through its various organs, healthy functions which are necessary to the prolongation of life and freedom from disease. We must not forget that sanitary reform must begin at home—in the ventilation of our rooms and houses, and the efficient cleansing of such; in cleanliness of person and clothing; in proper food, both solid and liquid, and in thoughtful interest and supervision of all home sanitary affairs; and such not only for ourselves, but also for those who are dependent upon us, and for those who follow us.

Let us consider the causes of unhealthiness of houses.

The failing of any house in respect to healthiness may be attributable either (1) to the improper site chosen for the dwelling; (2) to the evil arrangements of the house consequent upon faulty planning; (3) to bad drainage, to the presence of cesspools, to unsound plumbing, to the want of disconnection and ventilation of the drains, or to a poisoned water supply. Within this circle will be found to move all the delinquencies which make themselves manifest in loss of health, sometimes culminating in death itself. The faults and virtues of a house are almost identical, wherever it may be situated. There is a very definite relation between the mode of construction of the house and the health of its inhabitants. We are just beginning to understand how to build houses so as to ensure the health of those who occupy them, but as long as the work of building them is largely confined to persons whose interest it is to rear the

greatest number of houses at the smallest possible cost, it will be vain to look in this department for any regard to sanitary laws. It is comforting to think that, so far as new houses are concerned, the cesspool is an evil of the past, but there are still a terrible number of these abominations to be found all over the country. Few fine old country mansions are without them; they existed in royal and noble dwelling-places in London until recent times. The situation of the house is important; health is affected by the soil in which the house stands, by its opportunity for exposure to wind and weather. The wise man "who built his house upon the rock" only considered its stability, but we in our generation must think of the effect on health of the soil on which the house is erected, as well as to consider how long the house will last. To show how health is affected by the soil we must learn something of the latter. It consists mostly of mineral, with some amount of vegetable and animal matter. It is upon the character and amount of the animal and vegetable matter upon the air and water which are contained in it, that its influence upon health depends. When soil is examined it is found to contain various gases, depending upon the composition of its solid constituents. Carbonic acid gas is present in all cases, but particularly in "made earth," or land that has been produced by emptying into some hollow all the rubbish that the dust cart can collect, until the ground is level. Here the gases are in excess from the decomposition of the foul materials. The air in the ground is not fixed and immovable; it is influenced by the action of the sun, by the density of the atmosphere, and also by deeper currents of air, which are dependent on the movement of water. Consider, then, the effect of building on any soil without taking precautions that it shall be dry, and that it shall not consist of "made earth." The house becomes occupied, and becomes warmer than the outside air, the earth immediately beneath it shares in this increased temperature, and air foul and damp rises into the house, carrying with it all the conditions necessary to produce ill-health. Let me give you an illustration. Two brothers of strong and vigorous stock, and giving equal promise of a long and active life, married wives of corresponding promise of future activity. Both were farmers. One brother built his house in an open and sunny spot, where the soil and sub-soil were dry; shady trees and embowering plants had a hard time of it, but the cellar was dry enough.

for a powder magazine. The house in all its parts was free from any traces of dampness and mould. There was a crisp and elastic feel in the air of the dwelling. The farmer and all his family had that vigorous elasticity that reminds one of the spring and strength of steel. Health and sprightly vigour are the rule, and sickness the exception. The farmer and his wife, though past three score, have yet the look and vigour of middle life. The other brother pitched his house in a beautiful shady nook, where the trees seemed to stretch their protecting arms in benediction over the modest home. Springs, fed by the neighbouring hills, burst forth near his house, and others near his barns. His yard is always green, even in the driest time, for the life blood of the hills seemed to burst out all about him in springs and tiny rivulets. But the ground was always wet, the cellar never dry, the walls of the rooms often had a clammy feel, the clothes mildewed in the closets, and the bread moulded in the pantry. For a time their native vigour enabled them to bear up against these depressing influences; children were born of apparent vigour and promise, but these one by one sank into the arms of the dreamless twin brother of sleep, under the touch of diphtheria, croup, and inflammation of the lungs. The mother went into a decline, and died before her fiftieth birthday; and the father, tormented and crippled by rheumatism, childless and solitary in that beautiful home which elicits the praise of every passer by, waits and hopes for death. Undrained soil is a veritable upas tree. Dampness, therefore, in our houses arises from a damp soil from water arising into the walls, rain beating through the walls, or coming from leaking or blocked water pipes. Damp houses are unhealthy by reason of the lowering of warmth giving rise to catarrhal, rheumatic, and neuralgic affections, all of which are greatly promoted by undrained dampness in the basements. A damp floor is three or four degrees colder than a drained one, and the damp, as it rises from the ground, forces emanations into the dwelling, which are the cause of the unpleasant smell occasioned. If the evil be that of a town, and consequently prevailed by the refuse of former occupations, the seeds of many specific fevers and other diseases may arise in emanations of this kind, hence the frequent prevalence of zymotic diseases in times of abundant rainfalls, when people are congratulating themselves that their refuse drains are being well flushed.

*Excessive Coldness of Air from Draughts or from Insufficient Warming.*—Although an airy house is the healthiest there may be not too much, but imperfect movement of air, so that strong currents are caused; or the temperature may be lower than is good for health, even if persons are well clothed.

*Impurity of the Air.*—This arises from the following conditions:—Impure air drawn from the ground or basement into the house, or passing over impure earth or deposits, air in houses contaminated by effluvia from closets or pipes, from combustion, from respiration and skin transpiration, from uncleanness of person, clothes, walls, floors, and furniture.

*Impurity of Water.*—Water delivered pure to a house may become impure on the premises, usually from uncleansed, uncovered cisterns, absorption of air from drains by the surface of the water, and sometimes by more direct leakage from pipes into cisterns. Lead may be taken up also by the water, and absorbed into the system. We must never forget that the bright and sparkling water may be highly charged with poison far more deadly than a slight admixture of substances offensive to the sight.

5. *Impurities from Uncleanliness of the House.*—Walls and ceilings all absorb impurities, which are given out again to the air, and often become highly impregnated with organic matters. The chinks of floors allow matters to collect below them, and then impure air rises into the room; or furniture may harbour dirt, and thus continually contaminate the air. The custom of re-papering walls without cleaning or removing the old paper, the decomposition of paste and papers on damp walls and the use of arsenical pigments may disengage impurities. In the houses of the poor which are not regularly whitewashed the half-crumbling plaster is often charged with animal impurities; or, as Dr. Richardson puts it shortly—To have your house healthy it must present no facilities for holding dust or the poisonous particles of disease; if it retain the one it is likely to retain the other. It must possess every facility for the removal of its impurities as fast as they are produced; it must be free from damp; it must be filled with daylight from all points that can be charged with light from the sun without glare; it must be charged with perfectly pure air in steady changing current; it must be maintained at an even temperature, and must be free from draughts;

it must have an efficient supply of pure and perfectly filtered water. A house possessing the advantages named under these heads cannot be far from a perfectly healthy house. It is a house in which disease will never be generated so long as it is kept up to its proper standard; it is a house in which disease, if it be introduced, will remain for the briefest possible period; it is a house which, after disease has left it, will admit of instant and complete purification. "Health consists of the even poise of the beam in every instance, and the moment the poise varies even by ever so little, then come distress, disordered function, and impeded healthy action." Suppose you were to ask me if there is anybody living in perfect health at this particular moment, it would be a difficult question to answer. Dr. Carpenter says, if by health we understand that there is no disturbance of the equilibrium of function in the body, it is probable that, on this basis, there is no one living who is perfectly healthy, but I think there are great numbers in whom the border line of the disturbance of equilibrium has not been passed, and in whom disease has not yet appeared. A knowledge of and compliance with the laws which regulate health and prevent disease is of the greatest consequence to these persons, for unhealthy home influences will prevent them throwing off their load. They are not ill and they are not well. A contest is going on between two forces, and sanitary or unsanitary conditions may decide the conflict. Disease works its way in many directions, and by a thousand and one means. There are some classes of diseases, which arise from the influence of morbid poisons, which can reproduce themselves in the human body. In these cases every person suffering from that particular form of disease becomes a manufactory of disease-producing particles. If these be brought in contact with other persons they spread that particular form in geometrical ratio. It is said that "one man's meat is another man's poison," and such is true, because one man will withstand influences which another man will succumb to, either because they have already suffered from the disease in question and are protected from its future consequences, or because some unknown condition is present which takes away their liability to suffer from it. This class of disease is called zymotic; it includes small-pox, fevers, cholera, diphtheria, measles, and their families. From these diseases 80,000 die annually. The amount of illness not ending in death will

correspondingly be enormous, and yet the greater part—I had almost said the whole—of this vast number of deaths is preventable, and is associated more or less directly with defects in drainage. The conditions producing fatality are of man's making; they are due to those changes which flow from the natural result of the act of living. The natural products of secretion, which are either retained too long within the body itself, or being excreted are not passed on to the vegetable kingdom for utilization, and re-application to the wants of man. These excreta are the main causes of this class of disease. It would be as impossible for zymotic diseases to exist among us, as it is for fish to live out of water, if all excreta were entirely removed, and immediately utilized. It is principally our drains and sewers that are made engines of destruction to an unsuspecting population. Unfortunately the evil is underground, away from observation. If we refer to the construction of the human body, it will prove to us, that it is but a mass of hidden drains, large and small, and, how directly the health of the individual is dependent on their condition! Having its several large channels, the body has also drainage between these and every part. There is no organ, no gland, no muscle, no nerve, but what has its full complement of drains for the continual removal of effete material. Each is so constituted that it cleanses and lubricates itself, for which purpose every internal surface is as soft as silk. Obstructions, congestions, and other diseases are merely typical forms, of "having something wrong with the drains." Is not the complicated framework of the human system, with its adaptations to the supply of every want of which the mind can be conscious, a fit symbol of the no less complicated conditions of modern civilization. The lower classes of animals, with their simpler requirements, have no such intricate arrangements of drainage tubes as is needful for the higher organisation of man and similarly, life in towns, presents more points of liability to disorder than rural life. Every action, every thought is accompanied with wear and waste of substances, muscle, brain, or some part of the human frame, and the drains are for the continuous removal of the effete exhausted material. If we are healthily endowed, with our drainage system in good order, this increasing work goes on without hitch, or nuisance, and, what we have in the individual body, we want in our towns and villages, namely, the systematic removal of all pernicious and accumulating refuse. A

little time ago, I was attending, in this parish, in a certain row of cottage houses, at one time, seven cases of zymotic disease, out of these seven cases three cases, children, died, and in each of the four houses where the illness was bad drainage was traced as the exciting cause; hence all was preventable; all the misery, anguish of the parents at the loss of their offspring, loss of wages, expenses of mourning, to say nothing of the doctor's bill, might have been spared them by care and thought. Look well, therefore, to your drains! It is well said that a mouse can get into a very big cheese through a very small hole; sewer gas is the same, it can make its way through almost a pin hole. Probably the greatest stroke that sanitation ever received was administered by the inventor of the bell-trap. I have seen it somewhere called the "death bell-trap." It is fortunate that the name of the originator has not come down to posterity, for he would have merited in the opinion of all thinking sanitarians nothing but censure. This trap is seen in most sinks, in many it enters the drain at the floor level; when the grating with its attached inverted cup is lifted off, the house is in direct communication with any undisconnected or unventilated drain, and, even when the cover is down in its place the water seal is so shallow that it is soon rendered useless by evaporation, or by filling up with grease or sand. If all the bell-traps throughout this country were examined at this moment I verily believe one-half of them would be found without the inverted cup, which forms the bell, or otherwise inoperative as traps. Take care, therefore, that your sink-pipes are disconnected, let the pipe be brought out of the wall outside at the floor level and turned on to a grate. Dr. Carpenter tells us that any sewer which smells offensively is wrongly constructed, and is antagonistic to health; sewers should not smell, fresh sewage does not smell, and a sewer should be as clean as our kitchen sink. The moment any kind of excreta has passed from the body, at that moment, or as soon as temperature is reduced, there is a cessation of those actions which give rise to offensiveness. The offensiveness produced within the body is not injurious to health under ordinary conditions, otherwise every person would rapidly poison himself. That offensiveness is gaseous and is soon dissipated, and there is a border line of time for removal before any kind of dangerous offensiveness can arise. When it is produced it is proof that the excreta have been kept within range of human life too long. The

offensiveness is caused by germs or molecules capable of reproduction in a different form from that which previously existed. They are material particles and not gaseous which have grown in the excreted matters outside the body. They are new cultivations, and are capable of doing serious mischief in the tissues of living persons. They are comparatively harmless within the body until they undergo a kind of change of nature which enables them to do things which they could not have done without that change, and which would not have taken place if there had not been something at hand to make them grow. There are some natural conditions which entirely prevent that change in a dangerous direction. These natural conditions are found in our Mother Earth, and in the growth of vegetable matter upon it. The animal and vegetable kingdoms co-exist in a beautiful state of mutual independence. As the vegetable kingdom pays tribute to man in affording beauty to the world and sustenance to the body, either immediately or through other animals, so do the exhausted tissues of men and animals become the essential nutriment of trees, fruit, and flowers. In the chemistry of the earth, to which the Divine law enjoins the consignment of all animal refuse, this wonderful transfiguration is effected, and it is in the two processes, waste and transformation, that the health of the race, the adornment of the earth, and order of nature are secured. Makinson Fox tells us that it may have been on this account that in the Symbolic Age Adam was made a tiller of the ground. Many other occupations would have fulfilled the curse, so far as the sweat of the brow was concerned. But the sweat of the brow, or the waste of life and labour, was directed to be wrought into the ground, showing that as the mystery of evil sends us all finally to the earth, so in the continual transfiguration of our own buried substances we are ever illustrating our redemption.

It has been found by experience, that in England, to one annual death in a body of men, two are, on an average, constantly suffering from sickness of some severity. There are two years of severe sickness to one of death. This signifies that, if we assume a duration of six weeks for each case of severe illness, there would be seventeen cases of such illness to each death; if we reckon the duration to be five weeks, we get 21 cases to each death, or if we further reduce the duration to four weeks, the number of cases of incapacitating illness to each

death becomes 24. So we may be pretty clear, that about one out of twenty of those who suffer from incapacitating illness dies. We will take one of the group of zymotic diseases, typhoid fever. It has of late destroyed in England and Wales, in the working time of life, nearly 4000 in the year. Its mortality is about 15 per cent., so that, if 4000 die, about 23,000 recover from it. of these the average length of illness is about ten weeks. Here, therefore, from one of our preventable diseases, we have an annual loss of 230,000 weeks' work without reckoning what is lost by those who die. And the same may be said of nearly all the diseases that are most prominent in the bills of mortality. The record of death, sad as it is, tells but a small part of the losses of happiness and welfare that are due to sickness. It is as if in a great war we should have a regular return of the numbers killed, but none of the numbers wounded, though they are more than the killed, and may determine the issue of the war. Sir William Jenner (I quote from an address of his on the national value of Public Health) says that he has reason to believe, that we lose in England and Wales every year, in consequence of sickness 20,000,000 of weeks' work, or, say, as much as 20,000,000 of healthy people would do in a week. The number is not easily grasped by the mind. It is equal to about one-fortieth part of the work done in each year by the whole population, between 15 and 16 years old, or let us try to think of it in money. Rather more than half of it is lost by those whom the Registrar General names the domestic, the agricultural, and the industrial classes. These are rather more than seven millions and a half in number, and they lose about 11,000,000 of weeks, for easy reckoning, say at a pound a week, and here is a loss of £11,000,000 sterling, from what should be the annual wealth of the country. For the other classes who are estimated as losing the other 9,000,000 weeks' work, it would be difficult to make a guess in any known coin, for they contain our great merchants, our judges and lawyers, our statesmen, and legislators, our poets and writers, and others, who do more for the wealth and welfare of the country than can be told in money. Let me now tell of another loss of work, and of money, through sickness and early death. In the estimates I have given, no account is taken of those that are ill, or die before they are 15 years old. They are not reckoned as in the working time of life, though in some classes many thousands of them are ; in the

domestic, agricultural, and industrial classes of the registrar general, nearly half a million are included, and yet the losses of work due to sickness among children must be very large. Consider the time which might be spent in good productive work, if it were not spent in taking care of them while they are ill. Consider, too, the number of those who, through disease in childhood, are made more susceptible of disease in later life, or are crippled, or in some way permanently damaged, such as those who become deaf in scarlet fever, or deformed in scrofula, or rickets, or feeble and constantly invalided, so that they are never fit for more than half work, or for work which is only half well done. These losses cannot be counted, but they must be large; and there are others more easily within reckoning, the losses, namely, which are due to the deaths of those who die young. It may justly be said that all they have cost during their lives is so much sunk money, so much capital invested and lost. If they had lived to work, their earnings would have been more than sufficient to repay it, but they have died, and their cost is gone without return. The mortality of children under fifteen in 1882, was nearly a quarter of a million. What have they cost? If you say £8 apiece, there are more than £2,000,000 sterling thus lost every year. But they have cost much more than this, and much more still is lost by the loss of work they might have lived to do. It is, indeed, held by some that these things should not be counted as losses, that we have a surplus of population, and that, really, the deaths of children, though they may be the subject of a sentimental sorrow, cannot reasonably be regretted. I cannot bring myself to admit that such a thing should be even argued. I have lived sufficiently long in the work of a profession which holds that wherever there is human life it must be preserved, made happy if that can be, but in any case, if possible, preserved; and no argument of expediency will ever make me believe that this is wrong. Man is born to trouble as the sparrows fly upwards, and too many of us are ready to shrug our shoulders at what we assume lazily to be one of the necessary penalties paid for our higher civilization, and to talk vaguely of the "survival of the fittest." The preservation of life is the first instinct of the individual, and it clearly ought to be an abiding principle with the community. There is no doubt that we lose largely not only in happiness, but in wealth, by the death of these poor children. I will add one more

illustration of these losses. The deaths of persons between 25 and 45 years of age (that is what may be deemed the best twenty years of life), are annually between 60,000 and 70,000. In 1882 there were 66,000. Think, now, of the work lost by these deaths, and of how much of it might have been saved by better sanitary provisions. If one looks at the cause of their deaths, it is certain that many might have been prevented, or at least deferred. Say that they might have lived an average of two years more, and we should have had an increase in 1883 and 1884 of work equivalent to that of at least 6,000,000 weeks; as much, in other words, as 6,000,000 people could do in one week. One less death in a thousand of the population of Barnsley means 30 fewer deaths in a year; let one in every five be a bread-winner for a home, with a probable wage of a pound a week, or £50 a year. Then let us remember that this sum, derived from capital property invested, would at least mean £1000, so that the bread-winner in his earnings for his home is worth £1000 in cash, or invested capital. During the year six such bread-winners saved by sanitary measures would mean £300 of wages for support of homes, and an invested capital of £6000. Were a man a mere machine costing, or worth £1000, and earning £50 a year, how carefully it would be tended and cared for. But man is more than a wage-earning machine; he is the "head of the home," with all its duties, and all its responsibilities. This, and all other questions of sanitary science, are all-round questions; they cover the whole field of social life, and their importance is as great for the highest as for the lowest member of the community. Fever strikes down the highest in the land, as the most lowly, nay, more so. In the world there is no value but in human life, and human life has the greatest value when healthy and moral. This concerns our well-being, as a nation, equally with standing armies and iron-clad ships.

Food occupies a foremost place in home sanitary matters; as we can remember no time when we did not take food, and cannot easily imagine a life in which it would not be required; it seems superfluous to discuss its use. You may say do we not take food in order to allay the cravings of hunger—to satisfy our appetite? The French dramatist, Molière, in his play of the "Miser," represents that miserable creature, when he *must* have some guests at dinner, as arranging with his cook for a repast of which

only very little can be eaten, for it is to consist of dishes which will soon cloy and surfeit, whether or no they nourish those who partake of them. He defends this proceeding by the remark that we should not "live to eat," but "eat to live. When we, like him, recognise that we do not "live to eat," but eat, or should eat, for the sake of living, but living well, that is, usefully and nobly in the "God-appointed when and where," we exalt the place of her whom the Germans call the "home-mother," with whom lies the choice and preparation of the food. Therefore, this question is one of importance, as I will give you an example to show. A few years ago, several of our soldiers, who lived in some London barracks, were nearly starved to death. They became thin and weak. On inquiry it was found that they lived on boiled beef, which was boiled to rags and the liquid thrown away. Here we see how a set of strong healthy men, for whom nourishing food was provided, got no good from it, entirely from the ignorance of the person who prepared it. It has been well said that the subject of cookery is worthy of study, and one to which English people would do well to give their attention. If that man is a benefactor to his race who makes two blades of grass grow where one did before, that art must be worth cultivation that enables a person to make one pound of meat go as far, by proper cooking, as two by neglect and inattention. It would ill-become me, in the presence of the ladies of this audience, to set myself to guide and instruct them, and what I now say, I say it in all humility, but it is well-known to them, as the opening chapter of a well-known book says, "The doctor, unsupported by the cook's material aid, and the cook, unguided by the doctor's knowledge, are two powerful agents, half of whose strength is paralysed or misdirected. Combine their lights and resources, and you have at your command efficient means of alleviating, or even curing, numerous ills which flesh is heir to." If the doctor and cook together can do nothing with a case, it is, indeed, past hope of recovery. We thereby receive an unmistakable warning, that there is, in fact, a law of nature to which we must all finally submit. But I ask them to seek instruction particularly in classes of cookery, which have been established in this and other towns, and having seen the things made at the classes, to take opportunity of practice to attain perfection. This applies to everything from the infusing of tea, or making of porridge, to producing good broth or nice pastry.

The skilful operator must be kept well in practice by frequent repetition. This may seem (as Miss Blythe says in her paper on "Domestic Economy") a superfluous remark, but it can scarcely be deemed so in view of the hours of daily practice given to *attain*, or *retain*, rapid manipulation on a musical instrument, contrasted with the one occasion held to be enough for learning to prepare a good dish. In a little moral, oft told, story of some children who tried to spin, but had the grief of seeing the flax which had passed in a fine thread through the nurse's hand snap in theirs, "Why cannot we do it?" they asked; "it seems easy." "Just so, children," answered the nurse; "you must just learn a thing before you can do it well; it is only practice that makes perfect." This aphorism, applied by the nurse to spinning, has equal force in reference to cooking. Cookery needs to make a good use of the raw materials for food, proper fuel and a choice of cooking utensils, because on them depends much with regard to economy in fuel, labour, and provisions. I always think that it bodes well for a young household when the kitchen is fitly set up with deal table and dresser, with useful crockery and ironmongery, before the room gets a mahogany table, a mirror, or a piano. Much depends on the selection and purchasing of provisions, the preparation of the food, and the actual cooking; and for all this *time* is needed, and some of you must have anticipated the conclusion I would press on you, that the house mother must be *in* the house. Of all the devices of modern times, none is more ruinous for the physical, mental, and moral welfare of families than that of the wife and mother being withdrawn from her place in the house to go to some other work. If I may give my advice, I would say, let variety be an important point in arranging the food and cookery of a family. Each meal should in itself supply the different ingredients required by our bodies—fat, oil, and starch, to make them warm, fibrine to give flesh, minerals, such as salt, to make bone. Many cheap and popular dishes meet these requirements, and have become matters of habit and taste, while they are scientifically good, as liver and bacon, beans and bacon, bacon and cabbage, bread and cheese, bread and butter, rice with milk, bread, or potatoes and meat, tripe and onions, fat pork and pease pudding, and so on. This list shows very markedly that variety does not mean costly dishes. I give you no receipts for dishes, as they are to be

found in every manual of domestic economy. I would only endeavour to show you that to attend well to the food and cookery of a household deserves the intelligent and careful application of whoever has the charge of it. Those who desire that the poor should be better instructed in the culinary art, will find a powerful argument in support of their views in a case recently reported at a London Police Court. A man was committed for trial for violently assaulting his wife, and the provoking cause, according to the poor woman's own evidence, was defective cookery. The husband declared that some fish which she had left for his supper was unfit to eat. At his request she made him some gruel, but it was burnt and thick, and then to make it thin she put in some water; this was not a very appetizing beverage, and he declined it also. Despairing apparently of her culinary efforts, the husband sent her for rum. This, at all events, it might have been expected, would be palatable, but alas! the poor misguided woman fetched it in a bottle which had contained hair oil. Even the rum was undrinkable. Then he fell upon her and beat her so savagely that for two months her life was despaired of. I know nothing of the history of this woman, but should not be surprised to find that she was a born Londoner, who had worked in a factory up to, or even after, her marriage. Girls thus brought up are too often deprived of the commonest domestic accomplishments, they get their meals ready prepared from a cook-shop, and too often spend their evenings in what is called "pleasuring." The result is, that they can neither cook, nor do anything to render a working man's home comfortable. It is in this direction, and not in the direction of book-learning, with which the poor are overdone already, that more education is urgently needed. Lady John Manners wrote a capital article in the *National Magazine* of last March, impeaching the luxury of the present day. She does the work with decision and energy. She contrasts the luxurious living of the present day with the simplicity of 40 or 50 years ago. She tells us how, in many of our country houses to-day, society gives itself up to a succession of meals, which succeed each other with brief intervals for rest, from morning hours till long past dewy eve. Lady John Manners has probably heard of Seneca writing the praise of "Poverty" on a golden table, the picture of the gross way in which some of the rich live is open to the objection of raising many delicate social questions which the world is not prepared to settle,

though there are too many political quacks who are ready with ill-considered schemes for settling them. As every damage a man does to himself inflicts injury on the community, it is obvious that men who pamper themselves by over-indulgence in eating and drinking, destroying their health and morals, and setting mischievous examples, work evil in many unseen ways. But it is a beneficent dispensation of Providence that no evil bears only bad fruits, we may go as far as Pope, and say, "All partial evil universal good;" but we may at least remember that every luxury in which the rich indulge brings money to somebody. There is no waste in nature, but, as Paley finely says to a young spendthrift, "You are only making crumbs of your guineas, and they will fall into poor men's laps." Of course, it shocks most men to think of roysterers tippling, and spilling rich wines and spoiling choice food, which might save the life of some poor woman in the next street; but it is shocking, also, to think, of poor people huddling together and shivering in cold, filthy houses, while the rich have in their well-warmed houses many more rooms than they want. There are many ugly spots on the face of our society, but seeing is not curing. Lady Manners consoles herself with the reflection that, with all this, the day may possibly come when one-half of the world will set itself in earnest endeavour to find out how the other half lives. When that knowledge is gained, some may see their way to ordering their lives in such a manner that, without neglecting their social duties, or compromising the future of those who come after them, they may themselves enjoy the one luxury that never palls--the luxury of doing good.

*The ventilation and warming of the house must not be forgotten. Air is probably the most important factor for our healthy home. It is the least capable of being observed, and yet it is the largest quantity in any house, large or small. The food supply occupies little space, the water supply still less, but our rooms must be capacious so as to afford a full and proper supply of air, for our houses and our rooms must not only shelter us and provide us with sleeping accommodation, but they must be also our storehouses of air and food. The supply of solid and liquid food for our meals each day is not more important than the constant supply of air-food, which on many occasions during each minute is partaken of by each of us and is breathed into our*

animal systems. It is true we pay for the solid food, and we see it on our plates, and we can touch, handle, and taste it, and it is equally true that we pay, not directly for the air-food, and that we cannot see, touch, handle, or taste it. But as certainly as the man has his ration of solid food placed on his plate before him, so he has his allowance of air-food measured out to him in the home he may choose to inhabit. Hence the necessity for cleanly homes to yield cleanly air for our momentary wants by day and night. When the atmosphere is tainted by animal exhalations it is often an easy matter to recognise such. When we enter from the open air into a crowded room, how obvious is the sense of stuffiness of the air and the odour of massed humanity. For a better example, take a well-filled railway carriage at the station on a winter's day, and when the train draws up the window panes are found running with water, and as you enter you encounter a fœtid vapour which almost overpowers you, and the stifling character of which is further evidenced by the sleepy, drowsy, and half asphyxiated state of the occupants of the carriage. Over and above the gases and vapours, the atmosphere of our rooms is liable to contain more or less dust diffused throughout the air. This dust may be partly visible at times, and may be derived to some extent from the outside air during windy weather. The street dust of our large towns has been examined and analysed, and has been found to contain fragments of hay and straw, hair and fibres, pollen of plants, cotton and woollen filaments, wings and other fragments of insects, spores and germs of organisms, besides fine particles of lime, coal dust, metal, iron, &c. The dust of our rooms is of the same character, accompanied by minute fibres, hairs, and scales from the skin—even when the air of a room appears clear, as when daylight is streaming abundantly into it, the closing of the shutters so as only to leave a slight chink for the sun to throw a beam of light across the room, reveals to the naked eye the numberless motes and particles which float in the air. The noxious effects of the gases and vapours we exhale have been at times mournfully illustrated. From our earliest days we have all heard of the Black Hole of Calcutta, where 146 prisoners were confined, with plenty of elbow room, but comparatively little air space, and practically no ventilation, and in a few hours 123 were dead, and only 23 survived, but with enfeebled frames. Another catastrophe of the same kind occurred after

the battle of Austerlitz, when 300 Austrian prisoners were confined in a small apartment, with moving space, but not air space, and 260 died, leaving only 40 survivors. But in most cases fatal results do not immediately follow, though the noxious effects are more or less apparent. The vitiated air in confined rooms when breathed, in part at least, over and over again, soon throw the animal system out of tone, the general health becomes impaired, there is quickly a falling off in the muscular and nerve power, the man or woman becomes more or less unfit for work, the boy or girl more or less unprepared for school, and all become more predisposed to ailments, especially those of a pulmonary character. This is proved by the high mortality from consumption which formerly prevailed among the Guards, which was believed to be due to the ill-ventilated barracks which they occupied, an opinion confirmed by the fact that when ventilation was improved the disease greatly diminished. Our dwellings, then, must be so constructed that the air within them, which we breathe, shall not be more impure than the source from which it is drawn, and it must be distributed in such volume, and in such manner, that while supplying us with all the air we need for respiration, it shall not in any way produce ill results. Normal air consists of 79 parts of nitrogen and 21 of oxygen. There is also an amount of carbonic acid, varying from 2 to 5 volumes in ten thousand; and the air also contains a certain amount of moisture which varies very considerably, that most conducive to health being probably from 65 to 75 per cent of saturation. This is the composition of air before it is breathed; but after respiration great changes have taken place, as much as 4½ per cent. of the oxygen is abstracted, and is replaced by almost as much carbonic acid. The proportion of carbonic and impurity may be taken as the measure of the contamination, for, though it does not include the watery vapour and the organic exhalation, yet these have a certain relation in quantity to the amount of the carbonic acid. Every adult man evolves about 16 cubic feet of this noxious gas in the 24 hours, so that we may take half a cubic foot as a fair average amount yielded by every man, woman, and child, during each hour. In our rooms, however, there are other sources of carbonic acid gas than the respiration of the occupants. Every gas jet yields it, and every candle and every oil lamp evolves it. Each small gas jet, burning one cubic foot of gas per hour, requires 10 cubic

feet of air to burn it, and yields two feet of carbonic acid, being as much as would be evolved by four of a family. An ordinary-sized gas jet requires 25 cubic feet of air to burn it, and yields about 5 cubic feet of carbonic acid, being equal to 10 of a family. A small paraffin lamp, and an ordinary candle, throw into the air as much carbonic acid as an adult. The necessity for the systematic removal of these aerial impurities from our rooms may be proved by their deadly action on flame and life. It is well known that where a candle or taper will not burn, an animal will not live. It does not necessarily follow that where a candle will burn an animal will live; but where a candle is extinguished you may depend upon it an animal will quickly die. Now, how are we to guard our homes from the deadly influences we are daily engendering? First, we must have our rooms airy, and not confined boxes; and secondly, we must look to their ventilation. The army regulations demand that each soldier be provided with sleeping space of 600 cubic feet. This requires a room 10 feet long, 6 feet broad, and 10 feet high. Even the 600 cubic feet for an adult is too small for sleeping accommodation were it contained in a glass case, or the doors and windows hermetically closed to renewal of air, for a man will breathe nearly 200 cubic feet of air during a night's rest of 8 hours: and the mixture of this quantity of air, which has actually passed through the animal system, with the remaining 400 cubic feet, would render the whole 600 cubic feet very noxious. The renewal of the air in our homes must take place by ventilation, either insensibly and practicably beyond our control, or sensibly and practically, within our reach and guidance. The *insensible* ventilation occurs in every room, even when closed, by the wind causing the air to pass in and out through all crevices and spaces in doors, windows, flooring, and through the plaster walls, as well as by the chimneys when people are careful enough to leave them open. Ventilation takes place by open doors and by open windows, either in the rooms or in passages or staircases. The principles of ventilation are very simple when you know what they are, and the practical application of these principles is very easy when you know how to carry them out. The spent and noxious gases or vapours including the carbonic acid, become diffused throughout the room in course of time, though when evolved from the animal system, and from candles, lamps, or gas jets, they are heated and

tend to rise in the greater part to rear the roof and accumulate there. This is done in spite of the carbonic acid being a heavier gas than air when cold, being half again as heavy as air. The accumulation of the carbonic acid and other vapours in the upper part of the room may be demonstrated by placing two burning candles at different heights in the room under a tall glass jar, when the products of combustion will extinguish the upper before affecting the lower candle. In many rooms the stifling effect of the air may be observed by mounting a table or a ladder, and further evidence of the deadly properties by the effect upon house cage-birds, which are often dead when the cages hang near the roof. In the ventilation of any room, means should be provided both for the ingress of pure air and the egress of the foul air. A single opening at the roof or the floor can at the least only provide very defective ventilation. A candle placed in a jar open only at the bottom will gradually poison the atmosphere sufficiently to extinguish itself, and a candle placed in a jar or a bottle with the mouth upwards will also be extinguished; but place the same candle in even a smaller jar, with a comparatively small opening near the bottom for the admission of pure air, and a similar small opening near the top for the escape of the foul air, and the candle will continue to burn vigorously. In the proper ventilation of our rooms we must provide equally for entrance of the good air and the exit of the bad air. The chimney must always be an important ventilator, very powerful when the fire is burning and the chimney heated; also, but less powerful, when the fire is not used, provided the damper is kept open, and the chimney is not choked with a bag of straw or other rubbish. Always keep the chimney open, it is a good ventilator of any room. The amount of air drawn in by any ordinary room fire during an hour, runs from 6000 to 20,000 cubic feet, according to the heat of the fire. In any case it must change several times an hour the whole air of an apartment. The ventilation of a room may be assisted much during its occupancy by a reasonable amount of ventilation, which may be carried out without draught. An ordinary wind blows at the rate of six to twelve miles an hour, and such would be unbearable in a room where people were sitting. A current of air going at the rate of a mile an hour is equal to  $1\frac{1}{3}$  feet a second, and such a current is not perceptible to the senses. When the air is blowing at two miles an hour, or three feet per second, then the draught begins to be observed.

Now, take a room and place ventilators on two sides of it, let each ventilator be 12 inches by 12 inches, or a square foot in size. Have the ventilators not exactly opposite to each other so that the currents may not pass straight across the room. It is wonderful what an amount of air can pass through the ventilators every hour. Take the current at one mile an hour, or  $1\frac{1}{2}$  feet per second, and these square foot ventilators will pass fresh air into the room and remove the used air to the extent of 90 cubic feet a minute, or 5400 cubic feet per hour. Without any special ventilation at all, but leaving the room door ajar by a single inch or two, and having the chimney open, the ventilation will proceed in a somewhat satisfactory manner; still more so if the window can be opened a little. If the lower sash be raised, and a slip of wood be inserted on which the window can be closed down, as I explained to you in my last lecture, it will leave a ventilating space between the lower and the upper sashes, which will be found most effective and beneficial as a ventilator without much down draught, as the entrance of the outside air will be directed upwards as it passes into the room. An ordinary sash three feet wide, if raised in this way by a single inch, will give 36 square inches of ventilating surface; and if the air is blowing at two miles an hour it will pass 2700 cubic feet per hour. The application of any of these methods in each particular case must be left to the intelligent judgment of the occupants of the home. When a room can have ready access to the outer air, then the insertion of Tobin's tubes, which communicate with the outer air near the floor of the apartment and pass up the side of the room for about 6 feet, so that the entrance air may be thrown into the upper part of the room, will be found very beneficial. Any system of ventilation of an apartment is materially aided by a fire in the room, and the great safety in the occupancy of many of our small houses lies in the fact that in the living room the fire required for daily use does triple service in the cooking of food, the warming of the apartment, and the ventilation of the home.

*Warming of the Home.*—Whatever means are used for warming our homes, we have but one object to attain, viz., the maintenance of a temperature in rooms occupied by day of from 55 deg. to 65 deg. Fahr. At night when people are in bed a much lower temperature is readily borne without interfer-

ence with health, but exception must be made for old, feeble, and very young people, whose power maintaining the warmth of their body is much less than those of middle age. There are at present only two systems of heating by which our rooms can be healthily and efficiently warmed. Firstly, that by which each room is supplied with a sufficient quantity of warm pure air from an external source. Secondly, that by which the heat alone is *radiated* in the room, that is by which the *heat* is supplied independently of the air to be warmed. The first of these systems of heating, which we may term that of *convection*, may for our purpose be immediately dismissed for attention, inasmuch as it can only be adopted in connection with a complete, complex, and somewhat expensive system of ventilation, and at present, at least, can only be carried out economically in connection with large buildings. The second system mentioned viz. : that of heating by *Radiation* is, in the present state of our knowledge, not only the one most generally adopted but also the one attended with the most satisfactory result. Heating by radiation may be carried out on three methods viz. : (1) by close stoves which are very rarely healthy and are always attended by a more or less disagreeable odour, further this system is not suitable for small rooms. (2) by radiation from pipes heated by hot water from a central boiler. But this system, whatever its merits in other respects, involves too great an original outlay to permit of its being introduced into cottages, or small middle class houses ; (3) by the open grate. On this system our rooms are heated by radiation from red hot coal burnt in an open grate, the products of combustion escaping up the chimney. This system, so far as consumption of coal is concerned, is perhaps the least economical that could be adopted, and will no doubt be ultimately superseded, but it has at least this additional advantage, that, besides warming the room, it necessarily secures a more or less efficient system of ventilation. Even situated as we are in the centre of the South Yorkshire coal field, "hard times" beleave us to exercise economy in our coal bills, and, therefore, whilst speaking of the warming of the house, you will allow me to describe a plan advocated by Mr. Pridgin Teale, of Leeds, for saving coal. I have given it a two year's trial, and I certainly find it very useful. Mr. Teale says, "The plan is simple, and can be applied to nearly every existing fireplace without any structural alterations. It is inexpensive, and can be made for a few shillings. For a

bed-room fireplace it need not cost more than two or three shillings, or for a larger one more than five shillings. It saves coal about one-fourth, *i.e.*, it confers on those who adopt it throughout the house the boon of having their coal for three months in every year for nothing, or the luxury of a fourth more of firing. It gives better, *i.e.*, more heat-giving fires, because a greater quantity of the cinder in the grate is incandescent, while at the same time it is burning slowly. It reduces very considerably the amount of soot and smoke by securing combustion at a higher temperature, as well as by prolonging the coke period of the fire. It abolishes cinders, because the grid on which the fire rests being kept hot, the cinders on reaching the iron, instead of being chilled below combustion point, continue incandescent, and burn away to a fine ash, which drops through the grid into the hearth. It saves labour of servants in carrying coal, in sweeping up the hearth, in dusting the room, and in carrying away and sifting cinders. It reduces the cost of scavenging, as a fire so heated produces no greater bulk of ash in a week than would result in ash and cinder from one day's ordinary combustion. Mr. Teale showed me, the other day, his kitchen range, fitted with an economiser, with the ash resulting from six weeks' consumption of coal undisturbed. It would certainly not have filled an ordinary-sized coal-pan, and the combustion was so perfect that nothing remained but a fine powder. The simple contrivance which achieves all this, and is named the "coal economiser," is nothing more than a moveable shield, standing on the hearth, which boxes up the hearth-chamber under the fire, and, by cutting off all draught that would pass through the bottom of the fire, retards combustion. At the same time, by rendering the closed chamber beneath the fire a reservoir of accumulated heat, it improves the quality of the combustion, and increases the temperature at which gases are given off, so that they burst into flame, instead of being wasted as smoke or soot, while, by maintaining the incandescence of the coke and cinder, it secures a large mass of radiating fuel in the grate. The Economiser should fit accurately against the lowest bar of the grate, *i.e.*, the bar which corresponds with the level of the grid. If the outline of the front of the grate is curved or irregular, the outline can be taken by a piece of small leaden pipe, moulded to the curve. It is,

moreover, of the greatest value in kitchen grates, not excepting the kitchener. Mr. Teale's plan of mending a fire is as follows :—Rake the hot cinders away from the back to the front of the grate, fill in the cavity thus made with pieces of coal, and cover the fresh coal with a pound or two of slack. In a short time the gases begin to blaze all over the surface of the mass, and when all the volatile constituents of the coal have been burnt off, there remains a mass of incandescent coke which lasts for hours. Such a fire, carefully made, and fitted with an economiser, lasts from four to six hours, or even more. Our domestic fire-places should not be so much like small blast furnaces as they too generally are. The fuel should burn quietly, consuming the combustible part of the fuel, allowing the gases—which are partly waste and partly consumed—to rise slowly and passively, and escape up the chimney, without blowing up the residue of the carbon with them. A strong and rapid current of air through a fire must mean waste, and most probably will mean also soot or smoke. The air which supplies oxygen to a fire should be wafted gently between and over the coals in the grate, not blown with a rush from below through them. All ordinary gas-stoves, particularly of the beehive class, vitiate and poison the air in the direct ratio in which they heat it; they lessen the vital powers of the occupants of the room in proportion as they insidiously promote their comfort. They either have no chimney to convey away the burnt gas—the mixture of hot carbonic and watery vapour, or the pipe or chimney is too small to carry away these products with sufficient rapidity. Disease and death, especially to the consumptive, lurk in the use of these stoves. They are, in fact, the very models of what stoves ought not to be, and they do exactly that which they ought not to do. If there is a chimney of sufficient width to carry away the poisonous products, it conveys away so much of the heat as to render such stoves in most cases practically valueless for heating a room. There are gas-stoves to which the objections I have raised do not apply, but they are, as compared with coal or coke stoves, comparatively more expensive and less efficient. There is a form of gas stove which I will mention before I leave this subject. I allude to the bright, open, glowing gas-stove, set up in an ordinary grate to simulate the common coal fire; but the warmth radiated into the room is probably not one-fourth of that of a coal fire of the same size.

It is, moreover, expensive to get up and expensive in use. It is, however, very cleanly, and may be lit and extinguished at a moment's notice, without any of the dirt or trouble and loss of time required by the coal fire. In this stove a row of Bunsen's or smokeless gas burners is placed immediately below a common open fire-grate. Over these burners are placed a number of masses of pumice or asbestos. In lighting the gas, which, when properly adjusted, burns with a blue, almost non-luminous and smokeless flame. The solid masses of asbestos, or other material, very shortly becoming heated to incandescence, glowing with bright red, closely counterfeiting a coal fire. The use of gas for heating purposes is increasing rapidly, and will doubtless in the future play a more important part in the warming of our rooms, "but this future is not yet close at hand." *The lighting of the home* must not be overlooked. Perhaps we are too much accustomed to think of light merely as an aid to sight, as the something which is necessary to enable us to find our way about the world and to perform these duties which we are called upon to undertake. But the relation of light to our existence is a much larger one than this, for the sun's rays contain elements which go far beyond the mere illumination of objects, and are concerned in the production of chemical changes in all living beings. The necessity for these chemical rays is well known to all of us, for the proper growth of plants; and there is no manner of doubt that man is also dependent upon them for the full development of health and strength, but sun-light has been shown by Professor Tyndall to prevent decomposition, and therefore it appears to serve the double purpose of aiding the growth of these organisms, which are necessary for man as well as for man himself, while it retards the production of others, which are antagonistic to his existence. A recognition of this law teaches us that health in our homes is dependent upon its use, and which is given by nature equally to us all. We have only to visit the sunless courts which are to be found in the poorer quarters of every large town to convince ourselves that want of light is by no means the least of the causes which tend to produce pale faces and low vitality in the inhabitants of these districts. Let us turn from the theoretical to the practical bearing of this subject. If we have the opportunity of arranging the aspect of our various rooms we must be guided by the use to which it is intended to

put them. Rooms in which we are to dwell must be so placed as to receive a maximum of light during the day: sleeping rooms, which are occupied at night only, must therefore give place in this respect to those which are inhabited by day. But we must not forget the certainty that sickness cannot be always absent from a house, and that the time will come when one or more bedrooms must be devoted to those who will require sunlight even more urgently than others who are not confined to one room. For it is no rare experience to those who have lived in hospitals to find a long and tedious illness begin to abate from the moment the sufferer is removed to some spot where he can take in more life from the source from which all life springs. The position of the window is not the only point for consideration; its size is a no less important matter. The model bye-laws of the Local Government Board require a window-space of one-tenth of the floor area of the room. If any fault is to be found with this rule it is on the score of insufficiency, the only objection to excessive window-space that can be found is the loss of heat, which results from the thinness of the glass and any imperfections in the fittings, but these can be remedied by the use of plate-glass, by double windows, and by better workmanship. In considering the use of *light in its relation to the eye*, insufficiency of light leads to books and other objects being placed nearer to the eyes than in the case where light is abundant; in this manner short-sightedness is induced, or where it exists already, is further increased. A few words may be said concerning the position of the inhabitants of the house with regard to the windows. Mr. Brudenell Carter has shown it is prejudicial to do close work, such as writing or needlework, in front of a window. The best position for the light is at the left side of the worker, so that the right hand, which is employed, does not throw a shadow upon the paper or work, and so the necessary raising of the eyes which takes place from time to time does not expose them to the glare of the light. These may appear small considerations, but they have a very distinct bearing upon comfort and upon health. Nor must you forget to consider the best means of reducing excessive natural light; blinds may be made of any material which shall sufficiently exclude the light. Much has been written about the choice of colour, but probably, so far as health is concerned, there is no reason why individual taste should not be consulted on this point. A passing reference to the

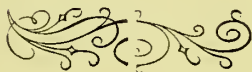
bearing of artificial light upon health may be made. Artificial light is used for two purposes; for the lighting of the room, and for the lighting of particular objects, such as books and needlework. Under ordinary circumstances, where a room is being used by a few persons engaged in reading or writing, it is altogether unnecessary that it should be brilliantly illuminated. The strong light is required in particular parts, and for this purpose oil lamps may be advantageously used, protected by a shade, which directs the light on the object looked at, and preserves the eye from the light itself. Gas does not destroy more air than do the number of candles or lamps which would be required to produce the same light, and therefore I do not condemn the use of gas, but simply limit it to those places where the product of its combustion can be readily removed. This can be done by a tube above the gas, which passes into some adjoining flue or into the external air. One of the best arrangements is that which surrounds the gas with a circular globe, so as to prevent the flame affecting too much the air of the room. Air is admitted by a pipe passing into a room at the point where another tube carrying off the products of combustion, pierces the ceiling, while the latter tube is surrounded by one that is larger, which also serves to carry off the impure air at the top of the room. Within the last few years the monopoly largely enjoyed by the gas companies has received a serious shock from the introduction of the electric light, and the fear of competition has induced the gas engineers to devise material improvements in their methods of illumination, while, on the other hand, the spirit of commercial rivalry between the various systems of electric lighting, which, it must be admitted, is still in its infancy, has led to every kind of unhealthy, if not actually fraudulent, manipulation of the share market, in order to reap a harvest of profit before another and better system shall have superseded each of those at present in existence. The electric light is making such rapid strides that we cannot but hope that it will be able shortly to be introduced into even small dwelling-houses, and supplant for brilliantly illuminating the room those methods which are necessarily accompanied by the consumption of air. As I spoke last year of clothing, I will say on this subject nothing except don't lend them. It was my lot to see last year a terrible instance of the evil results of this common practice among neighbours in an adjoining parish. A case of scarlet

fever broke out in a small clump of houses on the outskirts of the town. The child died; a levy was made upon the neighbours to supply or loan the black necessary for the family to attend the funeral. In one case a little frock was worn the following week by its rightful owner, with the result of its breaking out with scarlet fever. In a few days its mother began with the same disease of a very malignant type, and died within three days. The child only recovered after a tedious illness of many weeks. From this house the disease was carried to close by, where they lost three children, and again to two other houses of relatives half a mile away, with the result of each of these losing a child. Thus, I show you the loss of the valuable life of a mother and five children from lending one article of clothing.

“ Evil is wrought by want of thought,  
As well as by want of heart.”

A few months ago I was driving along a country road with a friend, and we passed a roadside inn, with the sign of the “Four Alls.” The sign had painted upon it figures representing a queen, a parson, a soldier, and a farmer. I enquired of my friend what was the interpretation of this strange sign, and I found that the queen signified that she ruled all, the parson that he prayed for all, the soldier that he fought for all, the farmer that he paid for all, and then as we drove along I thought the sign was not complete. Ruskin says, “The man is richest who, having perfected the functions of his own life to the utmost, has also the widest helpful influence, both personal and by means of his possessions over the lives of others.” The sign, to make it complete, wanted a sanitarian, a man who thinks for all, and whose aim is to emancipate the people from the thralldom of disease and death. To all of us, life is frequently very hard and unlovely, disease and death too often make invasions into our family circles, in harmony with those natural laws which regulate and control human existence. Mortals, we must pay the penalty of our mortality. But life should not be made worse, or more unlovely by ourselves; disease and death should not be introduced by ourselves, by our own carelessness, indifference, neglect. If you would realize Ruskin's ideas, and would like to assist in the consummation he desires you must bring your own helpful influence to bear. It is not for the rich man alone to make human beings happy, it is not for those alone who have possessions to make

life bearable, it is in the power of one and all to assist by personal endeavours to advance this aim." In bringing this too discursive address to a conclusion, I do not claim to have advanced any thing original. I have drawn largely upon the ideas and observations of others, my aim has been to depict, in homely and simple guise, some points as they occurred to me relating to health in your homes. It has been my object to show you that a large proportion of disease is produced by causes which can be prevented and removed, nay, more, that the most striking origin of illness exists in our houses. If the pictures are not true that I have drawn, and the remarks and inferences just, it is indeed time for the lion to paint the man.



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